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Preservatives in Leave-On Cosmetics Available on the Dutch Market

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After the prohibition of the use of methyldibromoglutaronitrole (and) phenoxyethanol, methylisothiazolinone, and methylchloroisothiazolinone (and) methylisothiazolinone in leave-on cosmetics in the European Union (EU) following the 'epidemics' of allergic contact dermatitis caused by these chemicals, the cosmetics industry had to search for alternatives that are both safe to consumers and effective in protecting the products against microbial contamination and deterioration. We recently found the following rates of sensitisation for preservatives in our 'Additional routine series' among 6886–8892 consecutive patients between 2015 and 2025: sodium metabisulfite 7.4%, iodopropynyl butylcarbamate 3.9%, 2-bromo-2-nitropropane-1,3-diol 1.0%, imidazolidinyl urea 0.8%, diazolidinyl urea 0.7% and phenoxyethanol 0.4% (data on file). To analyse whether this data reflects the current use of preservatives, we have screened the ingredient lists of 350 leave-on cosmetics in the Netherlands for the presence of preservatives allowed in the EU (Table S1).

1 | Materials and Methods

Ingredient lists of 350 leave-on cosmetics were collected from www.bol.com, the largest online retailer in the Netherlands. Details of the selection procedure and data collection can be found in the Supporting Information Materials and Methods.

2 | Results

Details of the cosmetics investigated (brands, countries of manufacture, number of products per brand and per country) are shown in the Tables S2–S4.

Twenty-four individual preservatives were identified in the analysed cosmetics (Table 1). The most frequently used was phenoxyethanol, present in 174 of 350 products (49.7%). When the lip salves—most of which probably do not require preservatives because they contain no water—were excluded, the proportion of products containing phenoxyethanol increased to 56.7% (170/300). The second most common preservative was sodium benzoate (54 products, 15.4%), followed by potassium sorbate (52 products, 14.9%), chlorphenesin (26 products, 7.4%), benzoic acid (18 products, 5.1%), salicylic acid and sodium metabisulfite (both 11 products, 3.1%) and methylparaben (10 products, 2.9%). All other 16 preservatives were found in only 1–4 cosmetics (0.3%–1.1%) (Table 1). The 'classic' cosmetics preservatives imidazolidinyl urea, diazolidinyl urea and 2-bromo-2-nitropropane-1,3-diol were not present in any product.

Benzyl alcohol, which is permitted in cosmetics as a preservative, was identified in 50 products (14.3%). However, it was almost always listed among the fragrance ingredients, suggesting it was used primarily for its perfuming rather than its preservative properties. Among the 50 lip salves, in only 8 (16%) were preservatives identified in the ingredient lists. Of the remaining 300 products, ingredient labelling in 79 (26.3%) did not list any preservative. The other cosmetics contained between one and five preservatives. The combination of sodium benzoate and potassium sorbate was common (40/300, 13.3%); 24 of these (60%) additionally contained one or more other preservatives, most frequently phenoxyethanol.

TABLE 1 | Preservatives identified in 350 stay-on cosmetics by product categories.

Preservatives	Numbers identified in cosmetic products					
	***n* total (*n* = 350) (%)**	**Day creams (*n* = 100) (%)**	**Night creams (*n* = 100) (%)**	**Sunscreens (*n* = 50) (%)**	**Eye creams (*n* = 50) (%)**	**Lip salves (*n* = 50) (%)**
Phenoxyethanol	174 (49.7)	57 (57)	62 (62)	22 (44)	29 (58)	4 (8)
Sodium benzoate	54 (15.4)	9 (9)	22 (22)	9 (18)	14 (28)	
Potassium sorbate	52 (14.9)	6 (6)	21 (21)	9 (18)	16 (32)	
Benzyl alcohol	50 (14.3)	15 (15)	16 (16)	10 (20)	2 (4)	7 (14)
Chlorphenesin	26 (7.4)	8 (8)	11 (11)		7 (14)	
Benzoic acid	18 (5.1)	7 (7)	5 (5)	5 (10)	1 (2)	
Salicylic acid	11 (3.1)	4 (4)	5 (5)		2 (4)	
Sodium metabisulfite	11 (3.1)	3 (3)	4 (4)	1 (2)	3 (6)	
Methylparaben	10 (2.9)	2 (2)	2 (2)	1 (2)	4 (8)	1 (2)
Piroctone olamine	4 (1.1)	1 (1)		3 (6)		
Propylparaben	4 (1.1)		1 (1)	1 (2)	2 (4)	
Silver chloride	4 (1.1)	1 (1)		3 (6)		
Sodium dehydroacetate	4 (1.1)	2 (2)	1 (1)		1 (2)	
Dehydroacetic acid	3 (0.9)			1 (2)		2 (4)
Ethylparaben	3 (0.9)	1 (1)			2 (4)	
Sorbic acid	3 (0.9)		1 (1)	1 (2)		1 (2)
o-Cymen-5-ol	2 (0.6)			2 (4)		
DMDM hydantoin	2 (0.6)		1 (1)		1 (2)	
Undecylenic acid	2 (0.6)		1 (1)		1 (2)	
Butylparaben	1 (0.3)	1 (1)				
Chlorhexidine dihydrochloride	1 (0.3)					1 (2)
Iodopropynyl butylcarbamate	1 (0.3)				1 (2)	
Sodium propylparaben	1 (0.3)					1 (2)
Sodium sulfite	1 (0.3)				1 (2)	
No preservatives declared	**79 (26.3)[a] 42 (84)[b]**	**30 (30)**	**23 (23)**	**15 (30)**	**11 (22)**	**42 (84)**

[a]Number and mean percentages 'no preservatives declared' of day creams, night creams, sunscreens and eye creams together (*n* = 300).
[b]Number and percentage 'no preservatives declared' in lip salves (*n* = 50).

3 | Discussion

It appears that the cosmetics industry has managed in finding preservatives that are effective and (relatively) safe for consumers. Phenoxyethanol was present in almost half of the products but had a rate of positive reactions in our "Additional routine series" of only 0.4%. Sodium metabisulfite had 7.4% positive reactions but was present in only 3.1% of the products. This preservative not infrequently shows positive patch test reactions in other studies also and was therefore recently included in the European baseline series [1]. The spectrum of relevant exposures to sodium metabisulfite is probably wider than currently appreciated and needs further exploration [1], but cosmetics may not be a frequent culprit product for sensitisation to sodium metabisulfite, considering its infrequent use in this category of products.

None of the other preservatives identified are well-known and frequent sensitisers; however, most have not been investigated in large studies of routine or targeted patch testing [2]. An unexpected finding was the presence of chlorphenesin, which was

formerly used as an antifungal, in 7.4% of the products. Allergic contact dermatitis to it was first reported in 1980 by Cronin in two patients from the presence of chlorphenesin in antifungal preparations [3]. Since then, less than 15 such case reports from chlorphenesin in antifungals (up to 1986) and cosmetics have been reported, including four patients in the past 10 years [4–6]. In Korea, in 2011–2012, 584 patients suspected of cosmetic dermatitis were patch tested with chlorphenesin 1% pet. and there were 24 (4.1%) positive reactions; their relevance was not mentioned. However, control testing showed chlorphenesin 1% and 0.5% pet. to be irritant with 8 respectively six reactions in 30 healthy subjects, whereas no reactions were seen to 0.25% and 0.1% pet. [7]. In several of the case reports, the 1% concentration, which may cause irritant reactions, had been used for patch testing.

In the United States also, chlorphenesin appears to be used (fairly) frequently in cosmetics. It was present in 5.4% of skin care products and 5.9% of makeup products on file in the database of the Contact Allergen Management Program (CAMP) of the American Contact Dermatitis Society [8]. In EWG's Skin Deep Cosmetics Database, of 137 770 products on file, 7312 (5.3%) proved to contain chlorphenesin [9].

Why the ingredient lists of over 25% of the products did not declare any preservative is unknown, but there are several possible explanations: (1) The product contains no water and therefore requires no preservative (e.g., many of the lip balms and salves); (2) preservatives were not declared on the label (mislabelling); (3) the online ingredient list on www.bol.com was incomplete; and (4) the formulations without formal preservatives are *self-preserving*, with multifunctional antimicrobial ingredients (e.g., caprylyl glycol, glyceryl caprylate, ethylhexylglycerin), plant-derived essential oils and extracts and/or conditions such as low pH or low water activity that inhibit microbial growth [10].

Caprylyl glycol was present in 132 of the 300 (44%) day, night, sunscreen and eye creams investigated by us, ethylhexylglycerin in 109 products (36%), and glyceryl caprylate in 13 (4.3%), in the vast majority in products also containing preservatives. Contact allergy to glyceryl caprylate appears to be rare [11] and frequencies of sensitisation to ethylhexylglycerin in routine testing ranged from 0.1% to 0.3% [12]. However, recently, a frequency of 0.9% positive reactions to 5% or 1% pet. caprylyl glycol in routine testing was reported from Belgium, with eight of nine reactions having probable relevance [13].

This study further shows that the use of formaldehyde-releasers has fallen out of favour. Only DMDM hydantoin was found in two products (0.6%). This is in sharp contrast with our previous 2009 investigation, in which we examined the ingredient labels of 496 leave-on cosmetics. Nearly 25% were found to contain one or more formaldehyde-releasers: imidazolidinyl urea, 8.3%; diazolidinyl urea, 8.1%; 2-bromo-2-nitropropane-1,3-diol, 5.2%; DMDM hydantoin, 3.6%; and MDM hydantoin, 0.2% [14].

4 | Conclusion

The most frequently used preservatives in leave-on cosmetics available in the Netherlands are phenoxyethanol (in about half of all products), sodium benzoate, potassium sorbate, chlorphenesin, and benzoic acid. They are unlikely to be frequent causes of allergic cosmetic dermatitis. Many products appear to be self-preserving, containing no official preservatives. Their safety has yet to be established.

Author Contributions

Anton C. de Groot: conceptualization, investigation, writing – original draft, writing – review and editing. **Norbertus A. Ipenburg:** investigation, writing – review and editing. **Thomas Rustemeyer:** supervision, writing – review and editing.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Research data are not shared.

References

1. S. M. Wilkinson, M. Gonçalo, O. Aerts, et al., "The European Baseline Series and Recommended Additions: 2023," *Contact Dermatitis* 88, no. 2 (2023): 87–92, https://doi.org/10.1111/cod.14255.

2. A. C. De Groot, *Monographs in Contact Allergy Volume I. Non-fragrance allergens in cosmetics (Part I and Part 2)* (CRC Press Taylor and Francis Group, 2018).

3. E. Cronin, *Contact Dermatitis* (Churchill Livingstone, 1980), 227.

4. B. Dyring-Andersen, J. Elberling, J. Duus Johansen, and C. Zachariae, "Contact Allergy to Chlorphenesin," *Journal of the European Academy of Dermatology and Venereology* 29, no. 5 (2015): 1019, https://doi.org/10.1111/jdv.12437.

5. A. Herman, L. de Montjoye, and M. Baeck, "Re-Emergence of Allergic Contact Dermatitis From Chlorphenesin," *Contact Dermatitis* 87, no. 5 (2022): 464–465, https://doi.org/10.1111/cod.14196.

6. C. M. de Moreira Nogueira, C. Dias Cerqueira, M. Â. Santos Ribeiro, and T. M. Marques Pereira Cabral Ribeiro, "Chlorphenesin-Induced Allergic Contact Dermatitis: An Overlooked Phenomenon?," *Dermatitis* 36, no. 5 (2025): 555–556, https://doi.org/10.1089/derm.2024.0433.

7. S. S. Lee, D. K. Hong, N. J. Jeong, et al., "Multicenter Study of Preservative Sensitivity in Patients With Suspected Cosmetic Contact Dermatitis in Korea," *Journal of Dermatology* 39, no. 8 (2012): 677–681, https://doi.org/10.1111/j.1346-8138.2012.01551.x.

8. K. M. Beene, A. Scheman, D. Severson, and M. J. Reeder, "Prevalence of Preservatives Across All Product Types in the Contact Allergen Management Program," *Dermatitis* 28, no. 1 (2017): 81–87, https://doi.org/10.1097/DER.0000000000000259.

9. "EWG's Skin Deep Cosmetics Database," EWG, accessed December 12, 2025, https://www.ewg.org/skindeep/.

10. N. Halla, I. P. Fernandes, S. A. Heleno, et al., "Cosmetics Preservation: A Review on Present Strategies," *Molecules* 23, no. 7 (2018): 1571, https://doi.org/10.3390/molecules23071571.

11. V. G. Herbert, J. M. Spiro, K. Reich, et al., "Glyceryl (Mono)caprylate - a New Contact Allergen," *Contact Dermatitis* 69, no. 6 (2013): 383–385, https://doi.org/10.1111/cod.12135.

12. R. Brans and C. Skudlik, "Occupational Allergic Contact Dermatitis to Ethylhexylglycerin in an Alcohol-Based Hand Disinfectant,"

Contact Dermatitis 93, no. 2 (2025): 180–182, https://doi.org/10.1111/cod.14802.

13. S. Kanokrungsee, E. Dendooven, and O. Aerts, "Caprylyl Glycol, a Trending and Highly Relevant Sensitiser in Cosmetics That Needs To Be Patch Tested Separately," *Contact Dermatitis* 93, no. 5 (2025): 418–421, https://doi.org/10.1111/cod.70019.

14. A. C. de Groot and M. Veenstra, "Formaldehyde-Releasers in Cosmetics in the USA and in Europe," *Contact Dermatitis* 62, no. 4 (2010): 221–224, https://doi.org/10.1111/j.1600-0536.2009.01623.x.

Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Data S1:** Supporting Information. **Table S1:** List of preservatives allowed in cosmetic products in the European Union. **Table S2:** Brands (alphabetical), countries of origin, number of products by brand per product type and in all products. **Table S3:** Number of brands by country. **Table S4:** Number of products by country.